Vaccine 37 (2019) 5439–5451

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Immunisation of migrants in EU/EEA countries: Policies and practices

Cristina Giambi [a,*], Martina Del Manso [a], Giulia Marchetti [a,b], Kate Olsson [c], Karam Adel Ali [c], Silvia Declich [a], the Venice survey working group [1]

[a] Istituto Superiore di Sanità, Viale Regina Elena 299, 00161 Rome, Italy
[b] Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Rome, Italy
[c] European Centre for Disease Prevention and Control, Gustav III:s boulevard 40, 169 73 Solna, Sweden

ARTICLE INFO

Article history:
Received 30 March 2019
Received in revised form 16 June 2019
Accepted 22 June 2019
Available online 8 July 2019

Keywords:
Migrants
Vaccination
Policy
Vaccine preventable diseases
Europe

ABSTRACT

In recent years various EU/EEA countries have experienced an influx of migrants from low and middle-income countries. In 2018, the "Vaccine European New Integrated Collaboration Effort (VENICE)" survey group conducted a survey among 30 EU/EEA countries to investigate immunisation policies and practices targeting irregular migrants, refugees and asylum seekers (later called "migrants" in this report). Twenty-nine countries participated in the survey. Twenty-eight countries reported having national policies targeting children/adolescent and adult migrants, however vaccinations offered to adult migrants are limited to specific conditions in seven countries. All the vaccinations included in the National Immunisation Programme (NIP) are offered to children/adolescents in 27/28 countries and to adults in 13/28 countries. In the 15 countries offering only certain vaccinations to adults, priority is given to diphtheria-tetanus, measles-mumps-rubella and polio vaccinations. Information about the vaccines given to child/adolescent migrants is recorded in 22 countries and to adult migrants in 19 countries with a large variation in recording methods found across countries. Individual and aggregated data are reportedly not shared with other centres/institutions in 13 and 15 countries, respectively. Twenty countries reported not collecting data on vaccination uptake among migrants; only three countries have these data at the national level. Procedures to guarantee migrants' access to vaccinations at the community level are available in 13 countries. In conclusion, although diversified, strategies for migrant vaccination are in place in all countries except for one, and the strategies are generally in line with international recommendations. Efforts are needed to strengthen partnerships and implement initiatives across countries of

Abbreviations: AT, Austria; BE, Belgium; BG, Bulgaria; CY, Cyprus; CZ, Czech Republic; DE, Germany; DK, Denmark; EE, Estonia; EL, Greece; ES, Spain; FI, Finland FR, France; HR, Croatia; HU, Hungary IE, Ireland; IS, Iceland; IT, Italy; LT, Lithuania; LV, Latvia; LU, Luxembourg; MT, Malta; NL, The Netherlands; NO, Norway; PL, Poland PT, Portugal; RO, Romania; SE, Sweden; SI, Slovenia; SK, Slovakia; UK, United Kingdom.

* Corresponding author at: Department of Infectious Diseases, Istituto Superiore di Sanità, Viale Regina Elena 299, 00161 Rome, Italy.
E-mail addresses: cristina.giambi@iss.it (C. Giambi), martina.delmanso@iss.it (M. Del Manso), giulia.marchetti@iss.it (G. Marchetti), kate.olsson@ecdc.europa.eu (K. Olsson), karam.adelali@ecdc.europa.eu (K. Adel Ali), silvia.declich@iss.it (S. Declich).

[1] Venice survey working group: Daniel Tiefengraber (Federal Ministry of Labour, Social Affairs, Health and Consumer Protection, Vienna, Austria); Tine Grammens, Chloe Wyndham-Thomas (Sciensano, Brussels, Belgium), Mie Neyts (Federal agency for the reception of asylum seekers, Brussels, Belgium), Geert Top (Flemish Agency for Care and Health, Brussels, Belgium), Paloma Carrillo-Santisteve (Office of Birth and Childhood, Brussels, Belgium); Nadezhda Vladimirova (National Centre of Infectious and Parasitic Diseases, Sofia, Bulgaria), Sonia Jordanova, Kremena Parmakova (Ministry of Health, Sofia, Bulgaria); Goranka Petrović, Vesna Višekruna Vučina (Croatian Institute of Public Health, Zagreb, Croatia); Maria Koliou (Ministry of Health, Nicosia, Cyprus); Jitka Castkova (The National Institute of Public Health, Praha, Czech Republic); Lisbet Krause Knudsen, Palle Valentiner-Branth (Statens Serum Institut, Copenhagen, Denmark); Irina Filippova (Republic of Estonia Health Board, Tallinn, Estonia); Paula Tiittala, Hanna Nohynek (National Institute for Health and Welfare, Helsinki, Finland); Julie Bouscaillou, Magid Herida (Ministry of Solidarities and Health, Paris, France), Daniel Lévy-Bruhl (French Institute for Public Health Surveillance, Paris, France); Ole Wichmann, Sabine Vygen-Bonnet (Robert Koch Institute, Berlin, Germany); Theano Georgakopoulou (Hellenic Centre for Disease Control and Prevention, Athens, Greece), Takis Panagiotopoulos, Theodora Stavrou (National School of Public Health, Athens, Greece); Zsuzsanna Molnár (National Public Health Center, Budapest, Hungary); Gudnason Thorolfur (Directorate of Health, Reykjavík, Iceland); Suzanne Cotter, Anna Clarke, Margaret Fitzgerald (Health Services Executive, Dublin, Ireland); Stefania Iannazzo (Ministry of Health, Rome, Italy); Ieva Kantsone (The Centre for Disease Prevention and Control, Riga, Latvia); Nerija Kupreviciene (Ministry of Health, Vilnius, Lithuania); Francoise Berthet, Pierre Weicherding (Ministry of Health, Luxembourg); Tanya Melillo, Jackie M Melillo (Ministry of Health, Msida, Malta); Irene Veldhuijzen, Hester de Melker (National Institute for Public Health and the Environment, Bilthoven, The Netherlands); Marianne A Riise Bergsaker (Norwegian Institute of Public Health, Oslo, Norway); Iwona Paradowska-Stankiewicz (National Institute of Public Health – National Institute of Hygiene, Warsaw, Poland); Etelvina Cale, Paula Valente, Teresa Fernandes (Directorate-General of Health, Lisbon, Portugal); Aurora Stănescu (Aurora Stanescu –National Institute of Public Health, Bucharest, Romania); Helena Hudecova, Ivan Bakoss (Public Health Authority, Bratislava, Slovakia); Marta Grgič Vitek (National Institute of Public Health, Ljubljana Slovenia); Aurora Limia, Laura Sánchez-Cambronero Cejudo (Ministry of Health, Consumer Affairs and Social Welfare, Madrid, Spain); Ann Lindstrand (Public Health Agency of Sweden, Solna, Sweden); Vanessa Saliba, Alison F. Crawshaw, Mary Ramsay (Public Health England, London, United Kingdom).

https://doi.org/10.1016/j.vaccine.2019.06.068
0264-410X/

origin, transit and destination to develop and better share documentation in order to guarantee a completion of vaccination series and to avoid unnecessary re-vaccination. Development of migrant-friendly strategies to facilitate migrants' access to vaccination and collection of vaccination uptake data among migrants is needed to meet existing gaps.

1. Introduction

In recent years European Union/European Economic Area (EU/EEA) countries have experienced an influx of refugees and other migrants [1] from low and middle-income countries. In 2017 more than 186,000 migrants arrived in Europe [2] and the estimates for 2018 show more than 144,000 new arrivals [3]. Although the trend is declining compared to 2016 (390,432 arrivals) [3], the numbers are still very high.

Migrants can be exposed to malnutrition, unsanitary conditions, displacement, among many other factors, which can make them a vulnerable group with an increased risk for acquiring communicable diseases. Moreover, overcrowding of holding/detention centres or refugee camps favour the spread of communicable diseases [4–10]. Also, unstable conditions in many migrants' countries of origin may have led to the disruption of national healthcare services, including immunisation programmes which has led to falls in vaccination coverage. For example, in Syria, the country of origin of the largest number of asylum seekers in the EU since 2013 [11], immunisation coverage for three doses of diphtheria-tetanus-pertussis and polio has greatly decreased, from 75 and 60%, respectively, in 2011 to around 50% in 2017. [12]. Concurrently, vaccine hesitancy has become a significant public health issue in several European countries and this is leading to increasing difficulties in maintaining adequate vaccination rates in the general population [13–15]. Geographical clusters with high proportions of unvaccinated people can lead to large VPDs outbreaks in host countries, even though the rest of the population is well protected with adequate vaccination coverage [16,17]. In 2018, 12,352 cases and 36 deaths due to measles have been reported in the EU [18] similar to 2017 when over 14,000 people contracted measles and 30 people died [19]. In the past two years, two people have died from diphtheria in the EU [20] and an outbreak of vaccine-derived poliovirus in Ukraine in September 2015 revealed that the risk of poliovirus reintroduction in the EU still persists [21,22]. The rapid influx of large numbers of potentially unvaccinated people could increase existing immunity gaps, as was shown by a number of outbreaks of VPDs in migrant settings described in Europe in the last years [6–10], some of which were due to contacts with the general population [7].

In November 2015, WHO-UNHCR-UNICEF advocated for the right and the need to include the provision of vaccines in public health interventions that target refugees, asylum-seekers and migrants and provided general principles to guide this process [21]. In 2015 and 2018 the European Centre for Disease Prevention and Control (ECDC) developed technical documents that provide scientific advice around on vaccination of migrants [23,24]. There is a general agreement on the need to assess vaccination status for all migrants using the available documentation, such as immunisation cards, and offering supplementary vaccinations to those unprotected, according to the national immunisation guidelines of the country that they have arrived in. However, migrants generally do not have a record of their immunisation status as individual immunisation cards are often lost during the long journey. Furthermore, since immunisation is a health intervention requiring a continuum of follow-up until the full schedule is complete, cooperation among the health authorities of countries of arrival, transit and destination is required.

Knowledge and sharing of immunisation strategies targeting migrants in host countries could represent a starting point to facilitate cooperation among the different countries. Data on strategies for migrant immunisation that are in place in EU countries is currently limited [25–27].

In 2017, in the framework of the EU-funded project "CARE: Common Approach for REfugees and other migrants' health" (www.careformigrants.eu), a survey that looked at immunisation policies targeting irregular migrants, refugees and asylum seekers in six European countries participating in the project (Croatia, Greece, Italy, Malta, Portugal and Slovenia) revealed differences in immunisations policies across countries [25].

In 2018, in order to have a broader picture of these policies, an extended survey was provided to all EU/EEA countries within the ECDC-funded project "Vaccine European New Integrated Collaboration Effort (VENICE)" (http://venice.cineca.org/). The aim of this survey was to map out immunisation policies targeting irregular migrants, refugees and asylum seekers in EU/EEA countries and to explore practices and procedures put in place to respond to their vaccination needs.

2. Methods

The survey, coordinated by the Italian National Institute of Health (Istituto Superiore di Sanità) in collaboration with ECDC, was conducted among the 28 EU and two EEA countries (Iceland, Norway) between the period January-April 2018.

Data were collected through an online questionnaire, developed using Survey Monkey (www.surveymonkey.com). The questionnaire, based on the survey designed for the CARE project, consisted of 79 closed-ended questions, with optional space for input of free text. The following topics were surveyed: (i) existence of regulations supporting vaccinations offered to migrants; (ii) immunisation strategies targeting child/adolescent and adult migrants, in terms of vaccinations offered; target groups for vaccination; check of immunisation status for VPDs; sites of vaccination delivery; (iii) recording and transmission of information on delivered vaccines; (iv) practices and challenges, including availability of procedures to guarantee migrant access to vaccination; immunisation Standard Operative Procedures (SOPs); data on immunisation uptake among migrant populations and their compliance with vaccination recommendations.

The site of vaccination delivery was defined as: (i) entry level, i.e. vaccination at the border/point of entry into the country (e.g., harbours or airports), (ii) holding level, i.e. vaccination provided in migrant centres/camps, (iii) community level, i.e. vaccination provided after arrival and partial integration into the community in the receiving country, through the same services used by the general population (e.g. in the primary health care centres or vaccination services) or through health services dedicated to migrants.

The survey was piloted in two EU countries (Germany and Sweden) during the period of November 2016-April 2017 and

modified accordingly. As the CARE survey was completed by Southern European countries of migration arrival (e.g. Greece, Italy and Malta) or transit (e.g. Croatia and Slovenia), we decided to pilot the new survey in two Northern European "destination countries" with a high migratory flow. Moreover, both Germany and Sweden have decentralized health systems so it was important to ensure that the questions were appropriate also for countries with sub-national variability.

The survey was provided to the ECDC National Focal Points for VPDs (nominated by the National Coordinator and with a specific role of coordination for vaccine preventable diseases within the country and in the relation with ECDC) from the 30 EU/EEA countries currently participating in the VENICE project; they were asked to complete the questionnaire involving, if needed, other experts in migration health or to identify experts with knowledge of vaccination and migration for completing it. In order to ensure consistency in the use of key migration-related definitions, we suggested experts to refer to the International Organization for Migration (IOM) glossary of terms [1], which is thus the reference for this study. We carried out a descriptive analysis of survey responses using absolute frequencies with percentages for all the categorical variables collected and used the free-text responses to better understand details of national situations (without performing any qualitative data analysis).

The experts were asked to validate their answers after data analysis, after the production of the final report and when reviewing the article manuscript.

3. Results

Among the 30 EU/EEA countries, 29 countries participated in the survey (i.e. the response rate was 96.7%). There was no response from the Czech Republic as all migration issues are under the direction and coordination of the Ministry of Interior. Among the 29 participating countries, the focal point for VPDs for Romania stated that immunization policies targeting migrants were not in place at the time of the survey; neither a national regulation/legal framework, nor other non-legally-binding national documents (such as technical guidance, guidelines or recommendations) supporting immunization of migrants were available in the country. Consequently, the following results refer to the 28 countries with migrant immunization strategies in place at the time of the survey.

3.1. National/regional regulation supporting immunisation of migrants

Twenty-four out of 28 (85.7%) countries reported having a national regulation or a legal framework supporting immunisation of migrants and four countries reported that they do not have one (EE, IE, LU, MT) (Table 1). In 18 countries (64.3%) the regulation/legal framework is part of the National Immunisation Programme (NIP); in five countries (17.9%) a national regulation/legal framework was specifically established for migrants' immunisation (BE, EL, HR, SI) or for all migrant health services (NL); in Spain, migrant children and adolescents are covered by the same recommendations as the general population, while for migrant adults there is a national regulation in place that outlines provision of health assistance in emergency situations, such as a large influx of migrants. In three countries (DE, FI, IT), although vaccination strategies are included in the NIP, a regulation specifically dedicated to migrants has also been established. A regional regulation supporting migrant immunisation is available in six countries (21.4%) (Table 1).

Most countries (22, 78.6%) stated that immunisation practices targeting migrants are homogeneous in the whole country. Six countries (AT, BE, DE, FI, IT, SE) reported that immunisation practices vary regionally. Among these countries, the responder for Belgium reported that there are regional differences in the routine immunisation programme for adults (Flemish community: adult vaccinations are based on the lifetime immunization schedule; French speaking community: diphtheria-tetanus-pertussis vaccination if offered only to pregnant women). Finland specified that the national legal framework supports immunisation of all migrants apart from irregular migrants, however the capital city Helsinki has a regulation that enables irregular migrants to access public health services, including vaccinations. Italy reported that immunisation policies targeting migrants should be homogeneous in the whole country as it is based on national law. However, due to the decentralised health system and the fact that some regions are more heavily affected by migration than others, in some local/regional areas further additional vaccines are offered to migrants in addition to those included in the national scheme.

At the time of the survey, other non-legally-binding national documents such as technical guidance, guidelines or recommendations that support vaccination offered to migrants were available

Table 1
National/regional regulation or legal framework supporting immunisation of migrants (n = 28).

National legal framework/ regulation	Country	Tot.	%*
No national legal framework/ regulation	EE, IE, LU, MT	4	14.3
Part of National Immunization Programme (NIP)	AT, BG, CY, DE, DK*, FI, FR, HU, IS, IT, LT, LV, NO, PL, PT, SE**, SK**, UK	18	64.2
Specifically established for migrants' immunization	BE, EL, HR, IT, SI	5	17.9
Specifically dedicated to migrant health services	DE, FI, NL	3	10.7
Other	ES^	1	3.5
Regional (or other intermediate level) legal framework/regulation			
No regional legal framework/ regulation	BG, CY, DK, EE, EL, FI, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PT, SE, SI, SK, UK	23	82.1
Yes, IN ALL REGIONS (or other intermediate level) it is part of the regional regulation/legal framework for vaccinations	BE	1	3.5
Yes, ALL REGIONS (or other intermediate level) established a regulation/ legal framework specifically for migrants' immunization	BE, PL	2	7.1
Yes, SOME REGIONS (or other intermediate level) established a regulation/ legal framework specifically for migrants' immunization	AT	1	3.5
Yes, SOME REGIONS (or other intermediate level) established a regulation/ legal framework for all health services specifically dedicated to migrants	DE, ES, FI	3	10.7

The sum of percentage exceeds 100% because some countries have chosen more than one option.

* DK: only children and adolescent are covered.

** SE, SK: only children are covered.

^ ES: children and adolescents are entitled to the same recommendations as general population; for adults a national regulation provide health assistance in special situations. Spanish Ministry of Health is working on a guideline about migrants which has a specific section for vaccination and accelerated immunization program.

in all 28 countries except seven (BG, CY, FR, HR, HU, LU, LV). France is planning to put in place specific guidelines for vaccinations offered to migrants in 2019.

3.2. Child and adolescent migrants: Immunisation policies

All 28 countries have policies in place for offering vaccinations to migrant children/adolescents (Fig. 1), however there are differences between the countries. Although Luxembourg has no legal framework/regulation nor any non-legally binding national document in place, the responder for this country specified that they follow national recommendations for immunisation that target the general population including migrants.

Asylum seekers are offered vaccinations in all countries; details for target groups by migrant status and age are reported in Table 2.

In six countries (21.4%), national strategies include specific indications targeting people coming from specific countries of origin:

- Belgium: Inactivated Polio Vaccine (IPV) for adolescents coming from countries with potential risk for international spread, while for children IPV is offered to all because it is included in the NIP.
- Finland: Bacillus Calmette–Guérin (BCG) vaccine for children under seven years of age coming from countries with a tuberculosis incidence $\geq$ 50/100,000 in the general population; hepatitis B vaccine for new-borns with a parent who originates from a country with prevalence $\geq$ 5% of HBsAg.
- Ireland: IPV for refugees from Syria.
- Norway: BCG vaccine for people coming from high risk countries; Hepatitis B vaccine for people coming from non-low incidence countries.
- The Netherlands: BCG vaccine for children up to 12 years of age coming from endemic areas.
- Slovakia: BCG vaccine for children coming from endemic areas, regardless of age.

Migrant children and adolescents are offered all the vaccinations included in the NIP appropriate for age in all countries but Slovakia. In Slovakia asylum seekers are offered IPV and measles vaccines after their arrival; furthermore, since the 2015 large migration influx, illegal migrants are offered the following vaccines: diphtheria-tetanus-pertussis (DTP), IPV, Haemophilus influenzae type b (Hib), Hepatitis B, Measles-Mumps-Rubella (MMR), pneumococcal conjugate vaccine (PCV), BCG, as well as influenza vaccination for children belonging to high-risk groups.

Twelve countries (42.9%) (DK, EE, ES, FI, FR, IS, LT, LU, LV, NL, NO, SI) reported that there is no specific vaccination that is considered a priority compared to others. Among the other 16 countries, high priority is given to polio vaccine (15 countries) and MMR vaccine (14 countries), followed by diphtheria-tetanus (DT) vaccine (11 countries).

3.3. Child and adolescent migrants: Immunisation practices

All 28 countries reported that migrant children and adolescents' immunisation status is checked verbally or by looking through

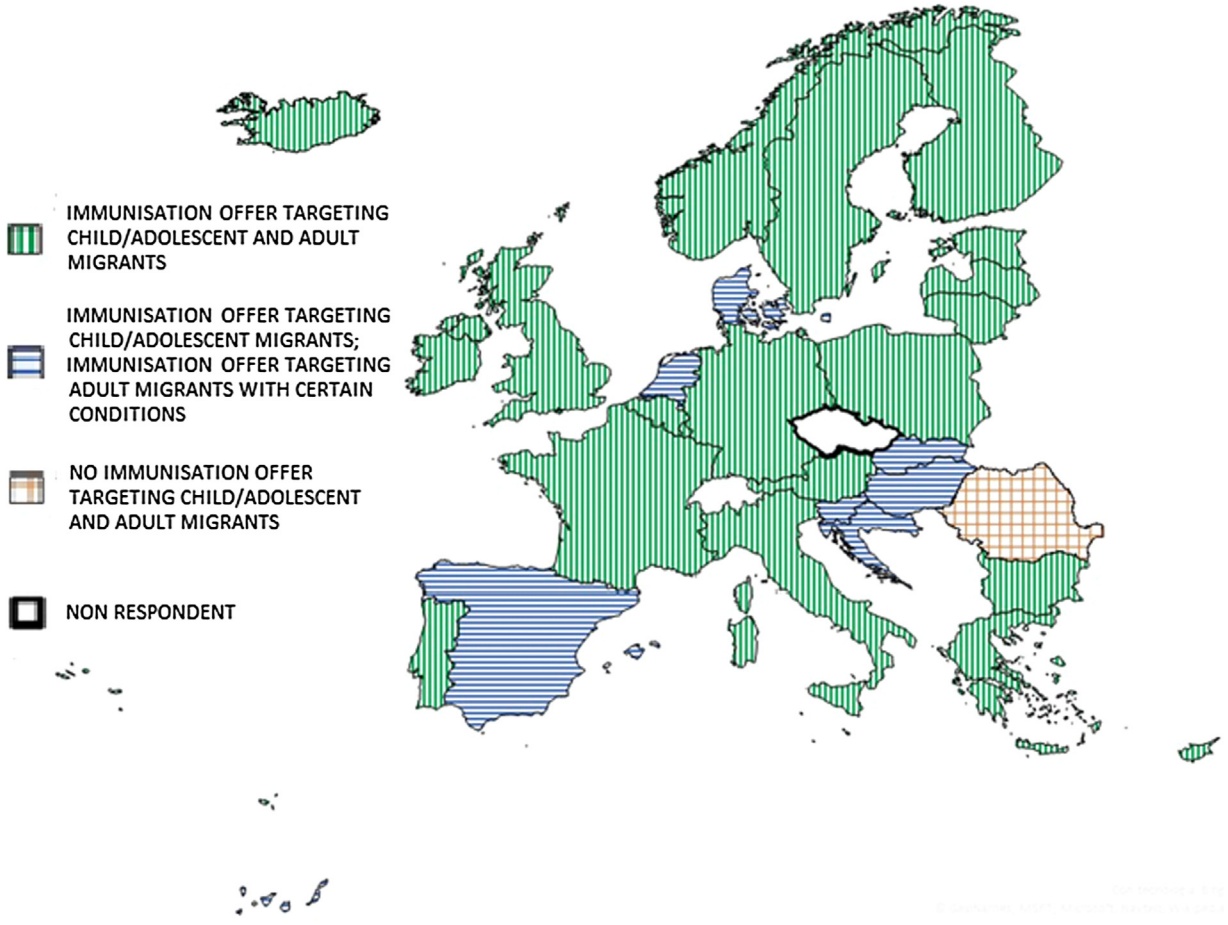

Fig. 1. Immunisations offered to child/adolescent and adult migrants in EU/EEA countries (N = 29).

Table 2
Immunisations offered to child/adolescent migrants in EU/EEA countries: target groups and vaccinations offered (N = 28).

	Countries	n	%*
Target group by migrant status			
Unaccompanied minors	AT, BE, BG, CY, DE, DK, EL, ES, FI, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SK, UK	26	92.9
Irregular migrants	AT, BE, BG, CY, DE, DK[#],EL, ES, FR, HU, IE, IS, IT, LT, LU, MT, NL, NO, PL, PT, SE, UK	22	78.6
Asylum seekers	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI[##], FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, SK, UK	28	100.0
Refugees	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI[##], FR, HR[###], HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, SK[####], UK	28	100.0
Age limit for vaccination offer			
18 years	BE, BG, CY, DE, DK, EE, ES, FI, FR, HR, IE, IS, IT, LT, LV, NL, PT, SE, SI, SK, UK[°]	21	75.0
Other age limit (years specified in brackets)	AT (15), EL (15), HU (20), LU (15), MT (17), NO (16), PL (19)	7	25.0
Childhood vaccinations offered to migrants			
All the vaccinations included in the National Immunisation Plan	AT, BE, BG, CY, DE, DK, EE, EL[^], ES, FI, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, UK,	27	96.4
Only certain vaccinations are offered to migrants	SK	1	3.6

[#] DK: irregular migrants have the right to medical care in case of emergency, including immunisation.
[##] FI: vaccinations are offered to all migrants with a residency permit and a citizenship, and particular attention is focused on refugee and asylum seeking; irregular migrants are not offered vaccination with the exception of some cities and municipalities.
[###] HR: refugees who are transiting the country, including irregular migrant, are not offered vaccinations; Immigrants such as those with granted asylum or international protection are eligible for the vaccination free of charge according to national immunization programme.
[####] SK: the vaccination is legally supported for children/adolescent of asylum seekers or unaccompanied children. Illegal migrants are not offered vaccinations, although since the huge migrant influx of 2015 a recommendation has been issued for this group. If a child is given the asylum it should be vaccinated according to our vaccination schedule as the general population.
[°] UK: vaccinations are offered to all migrants; the status check and immunisation offer is made when they attend a primary care service. The age limit depends on the specific vaccination and doses received as for the NIP (e.g. Men ACYW135 may be offered up to 25th birthday).
[^] EL: the NIP vaccines are given to migrant children in routine primary care services after they have settled in the community, while in campaigns and camps the policy is to carry out the following priority vaccines: DTP, IPV, Hib, Hepatitis B, MMR, PCV, BCG, as well as influenza vaccination for high-risk groups.

records/immunisation cards, when these are available. In case of unknown or uncertain immunisation status, laboratory evidence of immunity is requested in three countries (DK, IE, IT), mainly for hepatitis B, diphtheria and tetanus (Table 3).

Vaccination schemes specifically adapted to migrant children and adolescents' (in addition to those applied to the general population) are adopted in two countries (IE, NL) (Table 3).

Vaccinations are mainly delivered at holding (21/28, 75%) and community (27/28, 96.4%) level. Migrants are immunised at entry level in five countries. Informed consent is requested from migrant parents/guardians in 25 countries (89.3%), mainly verbally. Twenty-six countries offer vaccinations free of charge to all migrant children/adolescents, except for Ireland and Norway where there is a cost for some vaccinations (Table 3).

3.4. Adult migrants: Immunisation policies

All 28 countries reported that vaccinations are offered to adult migrants; however, 7 countries (25%) (DK, ES, HU, HR, NL, SI, SK) limit the vaccinations offered based on certain conditions (Fig. 1). The respondents of these countries have provided the following details:

- Croatia: asylum seekers aged 18–35 years;
- Denmark and the Netherlands: same risk groups as for the general population;
- Slovenia and Hungary: if there is an epidemiological or clinical indication (e.g. post-exposure prophylaxis for tetanus or in case of outbreaks);
- Slovakia: there is no legislative support for vaccination policy for adult asylum seekers and refugees; however, appropriate vaccinations are offered on the basis of the medical examination, especially against Hepatitis B (after serological test) and BCG vaccine for migrants from risk countries;
- Spain: all pregnant women and adult migrants only in emergency situations (i.e. in case of an outbreak).

Asylum seekers are offered vaccinations in all countries; details for target groups by migrant status and age are reported in Table 4.

There is no specific age cut-off limit for which vaccinations are offered to adults in all countries except for Croatia. In Croatia priority is given to people under 35 years of age; however, migrants of older age are eligible for free-of-charge vaccination if there is an epidemiological indication (e.g. in case of an outbreak). A new regulation supporting migrant immunisation has been proposed in Croatia, according to which this cut-off age limit will be removed.

In seven countries (25%), national strategies include specific indications targeting migrants arriving from specific countries of origin. IPV vaccine is offered to migrants coming from endemic countries or countries at risk of reintroduction in Belgium, Cyprus, Hungary (migrants from Pakistan and Afghanistan), Ireland (asylum seekers and refugees from Syria) and Italy. BCG vaccine is offered in Norway to migrants under 35 years of age coming from high risk countries and Slovakia. Hepatitis B vaccine is offered to migrants coming from non-low incidence countries in Norway.

Thirteen countries (46.4%) reported that adult migrants receive all the vaccinations included in the NIP appropriate for age and 15 only offer certain vaccinations to adult migrants (Table 4). Slovenia did not specify which vaccines are offered, stating that adult migrants are only vaccinated in case of epidemiological indications (e.g. hepatitis A in case of outbreak) (Fig. 2). The respondent for Italy specified that IPV and MMR vaccines are offered to adult migrants as a priority, but they are offered all the vaccinations included in the NIP if they are permanent residents in the country. In Finland, vaccinations offered to migrant adults are dependent upon their immigration status: resident migrants and refugees are offered all vaccinations included in the NIP, whereas asylum seekers are offered only certain vaccinations (dT, MMR, IPV and, if living in a reception centre, influenza vaccine).

Ten out of 28 countries (35.7%) (BG, DK, EE, IS, LT, LU, LV, NL, SI, SK) reported that no vaccination is considered a priority compared to others; among the other 18 countries, high priority is given to IPV vaccine (17 countries), followed by MMR vaccine (14), diphtheria (11) and tetanus (10) vaccines.

3.5. Adult migrants: Immunisation practices

In case of unknown or uncertain immunisation status, laboratory evidence of immunity is requested in four countries, mainly for hepatitis B (Table 5).

Table 3
Immunisations offered to child/adolescent migrants in EU/EEA countries: vaccination practices (N = 28).

	Countries	n	%
Use of laboratory evidence of immunity in case of unknown or uncertain immunisation status			
Not requested	AT, BE, BG, CY, DE, EE, EL, ES, FI, FR°, HR, HU, IS, LT, LU, MT, LV, NL, NO, PL, PT, SE, SI, SK, UK	25	89.3
Requested only for certain VPDs or specific conditions^	DK, IE, IT	3	10.7
Details on vaccination scheme			
Identical to that applied to the general population	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IS, IT, LT, LU, LV, MT, NO, PL, PT, SE, SI, SK, UK	26	92.9
Vaccination scheme specific for migrants^^	IE, NL	2	7.1
Sites for vaccination delivery			
At entry level	AT, BE, CY, PL, UK	5	17.9
At holding level	AT, BE, BG, CY, DE, DK, EL, FI, HR, HU, IE, IS, IT, LT, LU, MT, NL, NO, PL, SK, UK	21	75.0
At community level through the same services used by general population	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PT, SE, SI, UK	26	92.9
At community level, through health services dedicated to migrants	DE, EL, FI, IE, PL, UK	6	21.4
Informed consent before vaccinating			
Not requested	EE, HU, IS	3	10.7
Written consent	AT, IE, IT, LT, LU, PL, SK	7	25.0
Verbal consent	BG, CY, DK, EL, ES, FI, FR, HR, LV, MT, NL, NO, PT, SE, SI, UK	16	57.1
Other^^^	BE, DE	2	7.1
Payment			
Vaccinations offered free of charge	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI, FR*, HR, HU, IS, IT, LT, LU, LV, MT, NL, PL, PT, SE, SI, SK, UK	26	92.9
Migrants have to pay for some of the vaccinations	IE**, NO***	2	7.1

° FR: National guidelines for vaccination of persons with unknown or uncertain status (including migrants) are expected in 2019.

^ DK: in case of uncertain immunisation status, one dose of diphtheria, tetanus, pertussis, polio, Haemophilus influenzae type b (DTaP-IPV-Hib) vaccine or diphtheria, tetanus, pertussis, polio (dTaP-IPV) vaccine according to age (under or above 10 years of age) is offered and antibody level for diphtheria and tetanus is checked after a month; IE: laboratory evidence of immunity for hepatitis B in case of people coming from high endemic countries, IT: laboratory evidence of immunity for hepatitis B and tetanus.

^^ IE: BCG vaccine provided to those up to 15 years of age if low risk, up to 35 years if high risk; Meningococcus C vaccine up to 23 years of age; two MMR vaccine doses 1 month apart from age 4 years; three dTap/IPV vaccine doses 1 month apart for ages 10–17 years and one dTap/IPV vaccine dose followed by two dT/IPV vaccine doses 1 month apart for migrants ≥ 18 years; NL: asylum seekers get an additional MMR vaccine dose at 9 months of age (the first MMR dose is offered at 14 months according to the NIP).

^^^ BE: Written consent except for entry point where verbal consent is asked. DE: Written or verbal consent depending on the locality.

* FR: vaccinations are free of charge for most of the migrants as the French citizens, with modalities of reimbursement depending on administrative status (French citizen and regular migrants: 65% covered by the national health insurance, and 35% by private complementary insurance or complementary state insurance according to the income – undocumented migrants: 100% covered by the state medical assistance for mandatory vaccinations). Additionally, vaccination can be performed free of charge in public vaccination clinics.

** IE: vaccines are provided free of charge to children < 12 years. Adolescents get free vaccines within the school vaccination programme (menC, dTap, HPV-girls only); administration charges normally apply to adolescents for other vaccines. Vaccines are offered free of charge (both vaccine and administration) to refugees and asylum seekers. For irregular migrants, access to free vaccines is available, but costs for administration may be applied (unless provided by NGO service), except for young children who are enrolled in the national childhood programme.

*** NO: all vaccines are offered free of charge to children in primary and secondary school; older adolescents have to pay for some vaccines.

Table 4
Immunisations offered to adult migrants in EU/EEA countries: target groups and vaccinations offered (N = 28).

	Countries	n	%*
Target group: migrant status			
Irregular migrants	BE, BG, CY, DE, DK#, EL, ES, FR, HU, IE, IS, IT, LT, LU, MT, NL, NO, PL, PT, UK	20	71.4
Asylum seekers	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI##, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, SK, UK	28	100.0
Refugees	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI##, FR, HR###, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, UK	27	96.4
Age limit for vaccinations offered			
All ages	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI, FR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, SK, UK	27	96.4
Other age limit (35 years)	HR^	1	3.6
Vaccinations offered to adult migrants			
All the vaccinations included in the National Immunisation Plan	BE, BG, CY, DE, FI ##, FR, IE, LT, LU, NO, PT, SE, UK	13	46.4
Only certain vaccinations are offered to migrants	AT, DK, EE, EL, ES, HR, HU, IS, IT°, LV, MT, NL, PL, SI°°, SK	15	53.6

DK: irregular migrants have the right to medical care in case of emergency, including immunisation.

FI: vaccinations are offered to all migrants with a residency permit and a citizenship, and particular attention is focused on refugee and asylum seeking; irregular migrants are not offered vaccination with the exception of some cities and municipalities. As regard to adult migrants, vaccination offer depends upon the immigration status: resident migrants and refugees are offered vaccinations included in the NIP; asylum seeker adults are only offered certain vaccinations.

HR: refugees who are transiting the country, including irregular migrant, are not offered vaccinations; according to the existing regulation, vaccination priorities are given to immigrants such as those with granted asylum or international protection under 35 years of age, but migrants of older age are eligible for free-of-charge vaccination if there is an epidemiological indication for vaccination. A new regulation supporting migrant immunisation is going to be approved, according to which this limit age will be removed.

^ HR: vaccination priorities are given to children and younger adults (<35 years of age), but migrants of older age are eligible for free-of-charge vaccination if there is an epidemiological indication for vaccination. A new regulation supporting migrant immunisation has been proposed, according to which this limit age will be removed.

° IT: polio and MMR vaccines are offered to adult migrants as a priority, but they are offered all the vaccinations included in the NIP if migrants are permanent resident in the country.

°° SI: in case of epidemiological indications, e.g. in case of outbreak.

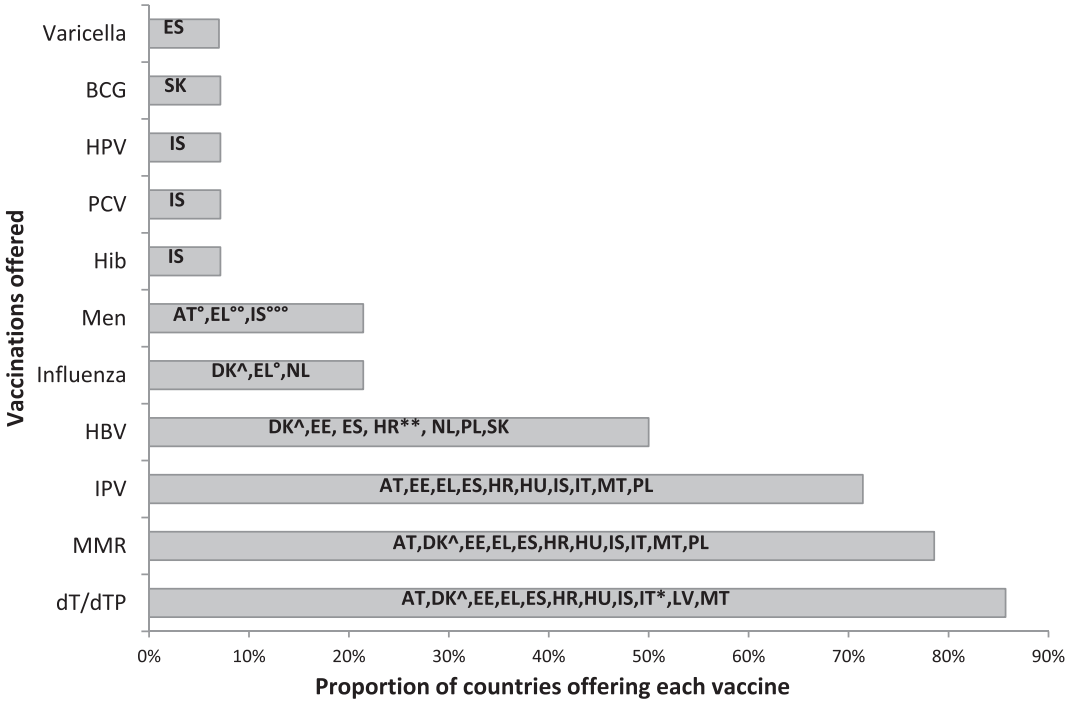

Fig. 2. Selective vaccinations offered to susceptible adult migrants or with undocumented immunisation status (n = 14). Countries offering each specific vaccine are reported in the bar. Vaccinations offered: BCG (Bacillus Calmette–Guérin tuberculosis vaccine); HPV (human papilloma virus vaccine); PCV (pneumococcal conjugate vaccine); Hib (Haemophilus influenzae type b); Men (meningococcal vaccine); HBV (hepatitis B vaccine), IPV (inactivated polio vaccine); MMR (measles-mumps-rubella vaccine); dT/dTP (diphtheria-tetanus/ diphtheria-tetanus-pertussis).. °AT: meningococcal C containing vaccine. °°EL: meningococcal vaccine in case of outbreak (ACYW135 quadrivalent vaccine or monovalent vaccine according to the serogroup of meningococcus responsible for the outbreak); influenza vaccine to risk groups.°°°IS: meningococcal C conjugate vaccine. ^DK: one MMR dose to all susceptible adults; the other vaccines offered to risk groups (MMR to susceptible women in childbearing age, hepatitis B vaccine in case of close contacts of patients affected by chronic hepatitis B, dT in case of injury, influenza vaccination in case of underlining chronic conditions). *IT: tetanus offered in case of exposed wounds. **HR: in case of epidemiological indication (i.e. close contacts with HBsAg positive persons).

Vaccination schemes specific for adult migrants, different from those applied to the general population, are adopted only in three (IE, FI, MT) out of 27 countries (11.1%) (there was no response from Cyprus for this question) (Table 5).

Vaccinations are mainly delivered at holding (19/28, 67.9%) and community level (27/28, 96.4%); migrants are immunised at entry level in five countries. Informed consent is requested from migrants in 27 countries, mainly verbally. Twenty-one countries (75%) offer vaccinations free-of-charge to adult migrants; in seven countries (25%), adult migrants have to pay for some of the vaccinations (Table 5).

3.6. Information on immunised migrants: Data collection, recording and reporting

An individual vaccination card is given to migrants in most countries (Table 6). Information on delivered vaccines is recorded for children/adolescents in 22/28 countries (78.6%) and for adult migrants in 19/28 countries (67.9%). Methods for recording information differ greatly between countries (Table 6). The respondent from Slovakia specified that there is no routine surveillance of vaccine coverage in migrants; however, within the administrative survey performed once a year the regional public health authorities check the number of migrants vaccinated in their region. The respondent for Germany specified that procedures vary across centres/regions and that only the number of administered vaccines is collected by the Regional Health Authorities. In 13/28 countries (46.4%) individual data are not made available or transmitted from the sites where vaccinations are delivered to any other centre/institution and in 15/28 countries (53.6%) aggregated data are also not made available (Table 7).

Data on migrants' compliance with vaccination or immunisation coverage are not collected in 20 countries (71.4%). Only NL, LU, PL collect this data at the national level (Table 6).

3.7. Procedures and experiences to facilitate migrants' access to vaccination

Fourteen countries (50%) (BE, EE, FI, FR, HR, IE, IS, IT, LU, MT, NL, NO, PT, UK) have procedures (e.g. outlining dedicated staff, systematic flow of information or formal agreement) to ensure migrants' access to vaccinations at the community level (e.g. vaccination services/health workers/GPs/paediatricians) if vaccinations are not previously delivered at holding level. Procedures differ across countries and in some countries these may only apply to specific areas or target groups. Eight countries described their experience (Table 8).

3.8. Vaccine shortage

Among the overall 29 responding countries (including Romania), eighteen countries (62.1%) have experienced vaccine shortage in the past two years, with the different vaccines and during different time periods. However, no country reported that the shortage was due to provision of vaccinations to migrants.

4. Discussion

This paper provides the results from a survey of existing national immunisation policies and practices targeting migrants in 29 EU/EEA countries.

Table 5
Immunisations offered to adult migrants in EU/EEA countries: vaccination practices (N = 28).

	Countries	n	%
Use of laboratory evidence of immunity in case of unknown or uncertain immunisation status			
Not requested	AT, BE, BG, CY, DE, DK, EE, EL, FI, FR[#], HR, HU, IS, LT, LU, LV, MT, NL, NO, PL, PT, SE, SI, UK	24	85.7
Requested only for certain VPDs or specific conditions[##]	ES, IE, IT, SK	4	14.3
Details on vaccination scheme			
Identical to that applied to the general population	AT, BE, BG, DE, DK, EE, EL, ES, FR, HR, HUIS, IT, LT, LU, LV, NL, NO, PL, PT, SE, SI, SK, UK	24	85.7
Vaccination scheme specific for migrants[*]	FI, IE, MT	3	10.7
Not reported this information	CY	1	3.6
Sites for vaccination delivery			
At entry level	AT, BE, CY, PL, UK	5	7.1
At holding level	AT, BE, CY, DE, EL, FI, HR, HU, IE, IS, IT, LT, LU, MT, NL, NO, PL, SK, UK	19	67.9
At community level through the same services used by the general population	AT, BE, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PT, SE, SI, UK	26	92.9
At community level, through health services dedicated to migrants	DE, EL, FI, IE, NO, PL, UK	7	25.0
Informed consent before vaccinating			
Not requested	EE	1	3.6
Written consent	AT, IE, IT, LT, LU, PL, SK	7	25.0
Verbal consent	BE, BG, CY, DK, EL, ES, FI, FR, HR, HU, IS, LV, MT, NL, NO, PT, SE, SI, UK	19	67.9
Written or verbal consent depending on the locality	DE	1	3.6
Payment			
Vaccinations offered free of charge	AT, BE, BG, CY, DE, DK, EL, ES, FI, FR[°], HR, HU, IS, IT, LT, LU, LV, MT, NL, PL, PT, SK, UK	21	75.0
Migrants have to pay for some of the vaccinations[°°]	EE, IE, IS, NO, PL, SE, SI	7	25.0

IE: a "catch up" schedule is available for adult migrants with unknown vaccination status: BCG vaccine is offered to migrants up to 35 years of age if belonging to high risk groups; Men C vaccine for those up to 23 years of age; MMR vaccine 2 doses, delivered 1 month apart; Tdap/IPV vaccine one dose followed by two doses of dT/IPV vaccine at one month interval.
MT: one dose of IPV, diphtheria and tetanus vaccines.
IE: vaccines are offered free of charge (both vaccine and administration) to refugees and asylum seekers. For irregular migrants, access to free vaccines is available, but costs for administration may be applied (unless provided by NGO service).
IS: adult migrants get free vaccination if they have not received vaccination according to our national schedule. Other vaccinations are not free of charge.
NO: MMR and IPV are offered free of charge to all migrants and BCG depending on defined risk groups. All the other vaccines are not free of charge.
PL: adult migrants receive only certain vaccines free of charge (MMR, IPV, HepB, BCG, DT), instead all vaccines included in the NIP are free for children and adolescents, according to law.
SE: some vaccinations are offered free-of-charge if there is an epidemiological indication or in case of specific risk conditions or in some Regions.
SI: vaccinations are offered free-of-charge if there is an epidemiological or clinical indication or in case of specific risk conditions.
[#] FR: national guidelines for vaccination of persons with unknown or uncertain status (including migrants) are expected in 2019.
[##] ES: hepatitis B, varicella; IE: hepatitis B status for migrants coming from endemic regions; IT: hepatitis B and tetanus; SK: hepatitis B.
[*] FI: a special scheme exists only for asylum seekers with uncertain immunization status (they are offered a booster dose of dT, IPV and MMR vaccines); resident migrants are offered vaccinations according to the NIP.
[°] FR: vaccinations are free of charge for most of the migrants as the French citizens, with modalities of reimbursement depending on administrative status (French citizen and regular migrants: 65% covered by the national health insurance, and 35% by private complementary insurance or complementary state insurance according to the incomes – undocumented migrants: 100% covered by the state medical assistance for mandatory vaccinations). Additionally, vaccination can be performed free of charge in public vaccination clinics.
[°°] EE: adult migrants have to pay the following vaccines: MMR, HepB, polio.

The survey results show that most countries have adopted WHO-UNHCR-UNICEF principles [18] of recommending that access to vaccination should be provided as part of the overall health support offered to migrants. According to survey respondents, 28 out of 29 participating countries have implemented immunisation policies targeting migrants. However, policies and practices differ significantly across the EU, as has already been reported in the literature [25–27].

4.1. Policies and practices

The results from the survey showed that in the case of children/adolescent migrants, almost all (27) of the 28 countries having strategies for migrant immunization offer all vaccinations included in the NIP, in line with the international recommendations [21,23,24].

Reportedly, there are different immunisation policies in place for adult migrants across EU/EEA countries with 13/28 countries offering all vaccinations included in the NIP appropriate for age, whereas the remaining countries offer only certain vaccinations, mostly IPV, MMR, diphtheria and tetanus vaccines, as outlined in the ECDC guidance on screening and vaccination for infectious diseases in newly arrived migrants within the EU/EEA [24].

Additionally, in seven countries the vaccinations offered are not provided to all adult migrants, but limited to those migrants with specific conditions (such as specific health condition or country of origin). We expected this heterogeneity given that in EU countries immunisation programmes targeting adults are generally less well consolidated when compared to childhood immunisation programmes, even when targeting the general populations [28].

A survey that was conducted in 2017 by the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) that explored approaches to vaccination in recently arrived migrants in 31 EU/EEA countries [27], showed considerable variations in approaches between children and adults. In line with our study, the authors found that children mostly enter the national vaccination schedule of the host country, whereas the results of the survey differed in regards to the immunisations offered to adults. In fact, according to the ESCMID findings, adult migrants seem to be excluded from catch-up vaccination initiatives in most countries: priority was given to DTP, polio and MMR vaccine (in line with our results), however around half of the countries reported offering these vaccinations to adults. Instead, as mentioned above, we found that 28 reporting countries have immunisation policies targeting adult migrants, although seven of them limit the offer to those with certain conditions. To explain this difference,

Table 6
Information on vaccines delivered to migrants: data collection (N = 28).

	Countries	n	%
How is information on delivered vaccines recorded?			
Children/adolescent migrants			
Individual vaccination cards delivered to migrants	AT, BE, BG, CY, DE, DK, EE, EL, FR, HR, HU, IE, IS, IT, LT, LU, LV, NL, NO, PT, SI, SK, UK*	23	82.1
Electronic database specifically for migrants' immunisation	DE, DK, FI, HR, LU, PL	6	21.4
Paper archives specifically for migrants' immunisation	EL, HU, LU	3	10.7
Electronic immunisation registries for the general populations	BE, ES, FI, IE**, IS, IT, MT, NL, NO, PT, SE, UK	12	42.9
Paper immunisation registries for the general population	BG, HU, IT, LV, SK	5	17.9
Other	CY***, IE**, UK*	3	10.7
Adult migrants			
Individual vaccination cards delivered to migrants	AT, BE, BG, CY, DE, DK, EE, EL, FR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PT, SI, SK, UK*	24	85.7
Electronic database specifically for migrants' immunisation	DE, DK^, FI, HR, LU, PL	6	21.4
Paper archives specifically for migrants' immunisation	HU, LU	2	7.1
Electronic immunisation registries for the general populations	BE, ES, FI, IS, IT, NL, NO, PT, UK	9	32.1
Paper immunisation registries for the general population	BG, HU, IT, LV, SK	5	17.9
Other	CY***, SE^^, UK*	3	10.7
Are any data on migrant's compliance to vaccination or immunisation coverage collected?			
No	AT, BE, BG, CY, DK, EE, EL, ES, FR, HR, HU, IS, LT, LV, MT, NO, PT, SE, SI, UK	20	71.4
Yes, data available at national level	NL, PL, LU	3	10.7
Yes, data collected only in some localities	DE, IE, IT	3	10.7
Other	FI°	1	3.6
I don't know	SK	1	3.6

* UK: refugees entering the UK through the re-settlement programme have their information (full pre-entry medical health assessment, including vaccination) stored on a specific electronic database, which can be accessed by the relevant health services.
** IE: for children < 2 years of age, data are entered into local immunisation database as for resident population. For older children records are kept on file in holding centres and sent to the GP who takes on care when person moves.
*** CY: is about to establish an electronic database in collaboration with UN services and NGOs.
^ DK: the asylum system has their own health record which follows the migrants and cannot use the public electronic vaccination register because they do not have personal identifier; when asylum status is obtained, data may be entered in the National Vaccination Register.
^^ SE: the information is recorded in individual medical record; in some regions it is recorded in electronic immunization registries.
° FI: preliminary data on MMR and influenza vaccination coverage among second generation migrant children is available.

Table 7
Information on vaccines delivered to migrants: data sharing with other centres/institutions (N = 28).

	Countries	n	%
Are individual/aggregated data made available and transmitted from the sites where vaccinations are delivered to other centres or institutions?			
Individual data			
No	AT, EE, EL, FR, HU, LT, LU, LV, MT, PL, PT, SE, SI	13	46.4
To centres where migrants are relocated or moved	BE, CY, DK, FI, IE, NO, SK	7	25.0
To the Ministry of Health	–	–	
To the National Public Health Institute	HR, NL, UK*	3	10.7
To the Regional Health Authorities	ES	1	3.6
To the Local Health Authorities	FI, IT, UK*	3	10.7
To the national/regional Epidemiology Centres	HR, IS	2	7.1
To international institution (ECDC, IOM, WHO, UNHCR)	UK (IOM)*	1	3.6
Information not available at the national level	BG, IT	2	7.1
Other	BE^, DE^^, DK^^^,	3	10.7
Aggregated data			
No	AT, DE, DK, FR, IE, IS, LU, LV, MT, NO, PT, SE, SI, SK, UK	15	53.6
To the Ministry of Health	BG, CY, EL, ES	4	14.3
To the National Public Health Institute	BE, EE, FI, HR, NL	5	17.9
To the Regional Health Authorities	BE, BG, DE, EE, LT	5	17.9
To the Local Health Authorities	EE, HU, IT	3	10.7
To the national/regional Epidemiology Centres	PL	1	3.6
To the national/regional Migrant Health Centres	FI	1	3.6
To international institution (ECDC, IOM, WHO, UNHCR)	–		

^^^DK: the asylum system has their own health record which follows the migrant and cannot use the public electronic vaccination register because they don't have personal identifier; when asylum status is obtained, data may be entered in the National Vaccination Register, but it is not possible to see if it is a migrant being vaccinated.
* UK: refugees entering the UK through the re-settlement programme have their information (full pre-entry medical health assessment, including vaccination) stored on a specific electronic database, which can be accessed by the relevant health services. The information is shared with the: (i) International Organization for Migration, (ii) the Home Office Refugee resettlement programme and (iii) Public Health England, (iv) Local Authorities, (v) health services e.g. GP.
^ BE: through the electronic registration system to specific health personnel involved in vaccination.
^^ DE: individual data can be entered into a central database for migrants, which can be accessed by the federal institute for migration and public health authorities

Table 8
Procedures for migrants' access to vaccinations (N = 28).

	Countries	n	%
How is migrants' access to vaccinations at the community level guaranteed when vaccinations are not previously delivered at borders or at holding levels?			
No specific procedure	BG, CY, DK, ES, HU, IE, IT*, LT, LV, SI, SK, UK	12	42.9
Migrants are informed of their vaccination needs but they access to vaccinations at the community level by themselves	AT, DE*, DK, EL, FR*, IT*, PL, PT, SE	9	32.1
Migrants are informed of their vaccination needs and dedicated health/social staff facilitate their access to vaccinations at the community level	BE, EE, FI, FR*, HR, IS, IT*, LU, MT, NL, NO, PT	12	42.9
A systematic flow of information from borders/ holding centres and vaccination services in the community is established	BE, IT*, NL, UK**	4	14.3
Formal agreement between centres and private/ public health services are signed to facilitate migrants' access to vaccinations at the community level	BE, FR*, IE, IT*	4	14.3
Practical experiences related to migrants' access to vaccination			
BE	Migrants are mainly vaccinated at entry level and in reception centres. Once the migrants leave the reception centre, children and adults are vaccinated at the local health services. For children < 6 years of age, information on vaccination status of the children is transmitted to the paediatric services that continue at community level the immunisation programme started at the reception centres. For individuals aged 6–18 years, information is transmitted to school health services. For adults, most of the vaccination is completed at entry level and in the reception centres. If not, people are vaccinated by the GP or other medical staff, who can look for the information on previous vaccinations in the electronic immunisation registry for the general population.		
FI	After arrival, all refugees and asylum seekers are offered a nurse appointment and an initial health examination where the vaccination status is checked and necessary vaccinations are recommended. Some vaccines might already be given at the first appointment. Nurses facilitate the migrants' access to subsequent vaccinations by booking new appointments.		
HR	Physicians working in the asylum centres cooperate with the local epidemiology unit to guarantee migrants immunisation. Upon arrival in the holding centre, an initial health examination is performed and the vaccination status is checked. If vaccinations are recommended, the local epidemiology unit provides needed vaccines.		
LU	If other vaccinations than those proposed according to the NIP are needed, migrants receive a prescription from the GP appointed by the Health Ministry, visiting on a regular basis the holding centres, to organise the requested vaccination in collaboration with an independent GP. This procedure is due to the fact that the GP appointed by the Ministry of Health is not entitled to vaccinate people. Therefore, an independent GP, practicing in a private practice, is involved. The independent GP is paid on a fee, with the cost of this service covered by the national health system (free-of-charge for the migrant). The appointments with the independent GP is taken in collaboration with the social workers.		
MT	Migrants are given appointments for vaccination at the immunisation centre.		
NO	All migrants are offered a medical examination at community level and information about vaccination is part of this.		
SK	Migrants in the asylum centre are visited by the health care professionals authorised by the Ministry of Interior Affairs; they perform the medical check-up and might direct certain people to other necessary medical procedures and for certain vaccinations.		
UK	There is not a specific procedure but all refugees who are resettled through a resettlement scheme undergo a pre-departure health assessment in the country of origin, where they are offered vaccination/catch-up vaccination in line with the NIP.		

* DE, FR, IT: Procedures vary locally.
** UK: there is no specific procedure but at the time of registration with a GP a health check is con ducted and this includes checking immunisation status (and offering catch-up vaccinations). For refugees only, a systematic flow of information from borders/holding centres and vaccination services in the community is established.

we suspect that that the two surveys were respondent to by different stakeholders.

The WHO-UNHCR-UNICEF guidance [21] states that refugees and asylum seekers should have non-discriminatory and equitable access to health care services, including vaccines, irrespective of their legal status. In our survey all countries offer vaccination to asylum seekers, both children/adolescents and adults; however, the immunisation offer is less frequently extended to irregular migrants, especially adult. This leaves the potential for a significant number of unimmunised migrants. Estimating the number of irregular migrants is, by definition, problematic since we are dealing with a phenomenon that is outside the control of states; the European project Clandestino estimated the size of the irregular migrant population in Europe at 1.9 million to 3.8 million in 2009 [29].

The administration of the full vaccination schedule, which may require multiple appointments (with intervals of months among the doses), poses additional challenges when dealing with mobile populations such as migrants. We found that vaccinations are mainly delivered at holding and community level, in line with international indications that recommend not to vaccinate at border crossings unless there is an outbreak of a VPD in the host or transit country [21]. Starting immunisation at holding or community level makes planning and completion of the vaccination cycle and recording of information more feasible. The community-based service was identified as the main delivery model also among the EU and non-EU countries of the Mediterranean Area and the Black Sea basin [30].

Assessment of immunisation status before vaccinating is possible for certain diseases using serology, however this practice is uncommon and costly. In our study, very few countries take into consideration laboratory testing in case of unknown immunisation status. Previous ECDC guidance suggested verifying immunisation status for all migrants using available documentation and, if no or uncertain documentation exists, the individual should be considered unvaccinated [23,24]. A systematic review conducted in

2018 found no evidence on the benefit of carrying out pre-vaccination serological testing [31]. Moreover, it is often unreliable and could represent an unnecessary delay for a population which may be lost to follow-up.

4.2. Critical issues and next steps needed

We identified several critical issues. Firstly, information on delivered vaccines to migrants is not routinely entered into immunisation registries in several countries. To our knowledge, this is the first survey exploring the systems in place for the recording and sharing of data on immunised migrants in EU/EEA countries. Data collection methods are very heterogeneous (paper or electronic registries; databases specific for migrants or for general population), making it difficult to exchange and share information across countries. Immunisation data are transmitted to centres where migrants are relocated in only seven countries and to international institutions in only one country. To plan or complete a vaccination course, it is essential to keep track of delivered vaccines. The WHO-UNHCR-UNICEF guidance states that each vaccinee or child's caregiver should be provided with documentation of the vaccinations given to help avoid duplication of vaccination [21]. We found that in the majority of EU/EEA countries a vaccination card is delivered to migrants after immunisation, however this is considered insufficient to adequately track vaccinations administered to migrants because it can be lost during the journey or destroyed for the purpose of hindering personal identification. Since immunisation is a health intervention requiring a continuum of follow-up until the full schedule is complete, and migrants are subject to movement within and across countries, there is a need to consider stronger cooperation between the countries of arrival, transit and destination to develop better documentation and promote its sharing across countries. This would help to avoid migrants being left unprotected or being administered with unnecessary doses of vaccine.

Secondly, although immunisation is offered to migrants, their utilisation of services providing vaccinations could be limited. In our study, standard procedures to ensure migrants' access to vaccination at the community level (dedicated staff, systematic flow of information or formal agreement between centres and immunisation/health services) are in place in half of the surveyed countries. It is documented that several factors influence migrants' utilization of immunisation services, such as limited or no entitlement to health services, socio-cultural, educational-related, and socioeconomic reasons [32–34]. Also low income could create difficulties in accessing services that require any payment, even if the payment is minimal [32]. We found that certain vaccinations are not free-of-charge for all adolescent and/or adult migrants in seven countries. A 2017 study compared access to preventive health services between migrants and the general population in five EU countries and found that migrants have poorer access to Pap smear tests, colorectal cancer screening and influenza vaccination than the general population [35]. Differences also exist among migrant groups, with refugees reported to have a lower uptake of services compared with asylum seekers, and undocumented migrants are often excluded from national health services [29]. The European Vaccine Action Plan 2015–2020 proposes that all Member States in the Region pay special attention to migrants, international travellers and marginalised communities to ensure their eligibility and access to culturally competent immunisation services and information [36] and the UCL-Lancet Commission on Migration and Health proposes that solutions should include input from migrants and be specific to the diverse migrant populations [37].

We have collected some practical experiences related to migrants' access to vaccination (Table 8), whose sharing across countries could be useful to create models for ensuring migrant immunisation uptake and overcoming the barriers mentioned above. However, it should be underlined that the effectiveness of those procedures has not as yet been evaluated. A more comprehensive collection of good practices and experiences is being carried out by the WHO Regional Office for Europe, contributing to the development of an Action Plan to promote the health of refugees and migrants to be considered at the Seventy-second World Health Assembly [38].

Thirdly, we found that only three countries have national data on migrants' immunisation coverage. The collection of coverage data represents a pre-requisite for effective evaluation of interventions, which might highlight the need of corrective measures. Long-term strategies on migrant immunisation, other than indications for vaccination of target groups, setting and modalities of delivery, should also include procedures for data collection and evaluation as necessary phases of the whole process.

4.3. Strengths and limits

The strength of our survey is that the questionnaire was completed by experts belonging to an established longstanding ECDC network (or experts officially identified by the components of this network), involving country representatives working permanently within the area of VPDs at national level. Moreover, our survey was conducted in the frame of the VENICE project, working in the field of VPDs for over 12 years (http://venice.cineca.org/the_project.html).

The main limitation of our study is that we explored policies and practices at the national level but did not access their local implementation. In the framework of the 2017 ESCMID survey [27], EU/EEA country experts were asked if policies/guidelines for migrant vaccination are applied in practice with migrants: four of 32 experts stated they were always applied in practice, 16 only partly and two reported they were never applied in practice. Although that is an expert opinion, it shows that the development of a national policy does not always translate into its practical implementation. A review exploring the provision of immunisation services to migrants and refugees identified three main factors from the literature as being responsible for a lack of implementation of national recommendations and policies at the local level: staff shortage, poor training for health care providers on migrants' health needs and a lack of routine data collection and evaluation [32].

Another limitation of our survey is that, although at the top of the questionnaire we clearly suggested experts to refer to the IOM migration-related definitions [1], some respondents may have interpreted the term migrant somewhat differently. In addition, in some countries, the entitlement to health services depends on immigration status: immunisation policies and practices might differ between refugees, asylum seekers and irregular migrants, thus making it difficult to answer those questions regarding "all migrants" as per IOM Glossary.

Before concluding, we would like to cite the EU Council Recommendation for strengthening cooperation among EU countries in the fight against VPDs, adopted in December 2018 [20,39]. Among the recommendations, the European Commission recommends the development a virtual repository EU data warehouse with information on vaccine stocks and needs to mitigate the risks of shortages, mentioning, among the possible causes of shortage, extraordinary events such as an influx of migrants. We found that none of the responding countries have experienced vaccine shortage in the past two years due to provision of vaccinations to migrants.

5. Conclusion

According to our respondents, international recommendations on migrant immunisation [21] have been adopted in 28 out of 29 EU/EEA countries who participated in the survey, although offered

vaccinations, target groups, settings and modalities of delivery vary between countries, especially for adult migrants. Information on immunised migrants are collected, recorded and shared with other centres/institutions in a very limited number of countries, and with highly heterogeneous methods.

Further work might be needed to reduce the impact of different vaccination policies targeting migrants in different countries. However, this may be difficult to do due to varied migration patterns, financial resources and diverse health systems organisation.

Also, efforts could potentially be focused on strengthening partnerships and implementing initiatives across countries of arrival, transit and destination to develop and share better documentation in order to ensure immunisation and avoid revaccination. A common vaccination card that can be shared electronically across borders, as proposed by the European Commission in 2018, could be a successful method [20,39].

Finally, although vaccination is offered to migrants in most EU/EEA countries, migrants' utilisation of health services that provide vaccinations is not always ensured due to linguistic, socio-cultural and economic barriers. Development of migrant-friendly strategies to increase access to vaccinations at the community level, such as dedicated staff, systematic flow of information or formal agreement between centres and immunisation/health services, should be encouraged. Also targeted interventions, for example door to-door vaccination initiatives, media campaigns and health promotion interventions, should be promoted to improve migrant vaccination uptake, in line with national guidelines and recommendations. More research is needed to identify cost-effective and acceptable interventions [31,40] and, in general, better information and disaggregated data to support decision-makers to develop evidence-based policies, plans and intervention as stated in the WHO draft Global Action Plan 2019–2023 on promoting the health of refugees and migrants [41].

6. Authors' contributions

CG conceived and designed the study, developed the questionnaire, coordinated and monitored the study activities, collected and analysed the data and interpreted the results, drafted and edited the manuscript.

MDM conceived and designed the study, developed the questionnaire, coordinated and monitored the study activities, collected and analysed the data and interpreted the results and critically revised the manuscript.

GM conceived and designed the study, developed the questionnaire, coordinated and monitored the study activities, collected and analysed the data and interpreted the results and critically revised the manuscript.

KO conceived and designed the study, interpreted the results and critically revised the manuscript.

KAA interpreted the results and critically revised the manuscript.

SD conceived and designed the study, developed the questionnaire, coordinated and monitored the study activities, collected and analysed the data and interpreted the results and critically revised the manuscript.

The Venice survey working group collaborated to fill in the questionnaire for their own country and critically revised the preliminary paper.

All the author read and approved the final manuscript.

Funding

The survey was conducted in the framework of the VENICE project (Vaccine European New Integrated Collaboration Effort) (http://venice.cineca.org/) and received funding from the ECDC (specific Agreement No.5 ECD.7691 implementing Framework Partnership Agreement No. ECDC/GRANT/2013/014).

Declaration of Competing Interest

The authors declare that they have no competing interest.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2019.06.068.

References

[1] International Organization of Migration (IOM). Key Migration Terms. International Organization for Migration n.d. https://www.iom.int/key-migration-terms [accessed February 8, 2019].
[2] International Organization of Migration (IOM). Migration flows to Europe 2017 overview. 2018. https://migration.iom.int/docs/2017_Overview_Arrivals_to_Europe.pdf [accessed February 8, 2019].
[3] International Organization of Migration (IOM). Europe Flow monitoring 2019. 2019. http://migration.iom.int/europe?type=arrivals [accessed February 8, 2019].
[4] European Centre for Disease Prevention and Control (ECDC). Handbook on using the ECDC preparedness checklist tool to strengthen preparedness against communicable disease outbreaks at migrant reception/detention centres. Stockholm: ECDC; 2016. https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/preparedness-checklist-migrant-centres-tool.pdf [accessed February 8, 2019].
[5] World Health Organization (WHO) Regional Office for Europe. Migration and health: key issues 2019. http://www.euro.who.int/en/health-topics/health-determinants/migration-and-health/migrant-health-in-the-european-region/migration-and-health-key-issues [accessed February 8, 2019].
[6] European Centre for Disease Prevention and Control (ECDC). Epidemiological update: Measles among asylum seekers in Germany, 10 August 2016. 2016. https://ecdc.europa.eu/en/news-events/epidemiological-update-measles-among-asylum-seekers-germany-10-august-2016 [accessed February 8, 2019].
[7] Williams GA, Bacci S, Shadwick R, Tillmann T, Rechel B, Noori T, et al. Measles among migrants in the European Union and the European Economic Area. Scand J Publ Health 2015;44:6–13. https://doi.org/10.1177/1403494815610182.
[8] Jones G, Haeghebaert S, Merlin B, Antona D, Simon N, Elmouden M, et al. Measles outbreak in a refugee settlement in Calais, France: January to February 2016. Eurosurveillance 2016;21. https://doi.org/10.2807/1560-7917.es.2016.21.11.30167.
[9] Haas EJ, Dukhan L, Goldstein L, Lyandres M, Gdalevich M. Use of vaccination in a large outbreak of primary varicella in a detention setting for African immigrants. Int Health 2014;6:203–7. https://doi.org/10.1093/inthealth/ihu017.
[10] Vairo F, Di Bari V, Panella V, Quintavalle G, Torchia S, Serra MC, et al. An outbreak of chickenpox in an asylum seeker centre in Italy: outbreak investigation and validity of reported chickenpox history, December 2015–May 2016. Eurosurveillance 2017;22. https://doi.org/10.2807/1560-7917.es.2017.22.46.17-00020.
[11] Eurostat. Asylum statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Asylum_statistics#Citizenship_of_first-time_applicants:_largest_shares_from_Syria.2C_Afghanistan_and_Iraq [accessed February 8, 2019].
[12] World Health Organization (WHO). WHO vaccine-preventable diseases: monitoring system. 2019 global summary. http://apps.who.int/immunization_monitoring/globalsummary/estimates?c=SYR [accessed February 8, 2019].
[13] The Lancet. Addressing decreasing vaccine coverage in the EU. Lancet 2018;391:1638. https://doi.org/10.1016/s0140-6736(18)30942-5.
[14] D'Ancona F, D'Amario C, Maraglino F, Rezza G, Ricciardi W, Iannazzo S. Introduction of new and reinforcement of existing compulsory vaccinations in Italy: first evaluation of the impact on vaccination coverage in 2017. Eurosurveillance 2018:23. https://doi.org/10.2807/1560-7917.es.2018.23.22.1800238.
[15] Larson HJ, de Figueiredo A, Xiahong Z, Schulz WS, Verger P, Johnston IG, et al. The state of vaccine confidence 2016: global insights through a 67-country survey. EBioMedicine 2016;12:295–301. https://doi.org/10.1016/j.ebiom.2016.08.042.
[16] Fefferman NH, Naumova EN. Dangers of vaccine refusal near the herd immunity threshold: a modelling study. Lancet Infect Dis 2015;15:922–6. https://doi.org/10.1016/s1473-3099(15)00053-5.
[17] European Centre for Disease Prevention and Control (ECDC). Who is at risk for measles in the EU / EEA? Identifying susceptible groups to close immunity gaps towards measles elimination. Consulted experts. Stockholm: ECDC; 2019. https://ecdc.europa.eu/sites/portal/files/documents/RRA-Measles-EU-EEA-May-2019.pdf [accessed February 8, 2019].

[18] European Center for Disease Prevention and Control (ECDC). Monthly measles and rubella monitoring report, February 2019. Stockholm: ECDC; 2019. https://ecdc.europa.eu/sites/portal/files/documents/measles-rubella-monthly-monitoring-report-february-2019.pdf [accessed February 8, 2019].
[19] European Center for Disease Prevention and Control (ECDC). Monthly measles and rubella monitoring report, February 2018. Stockholm: ECDC; 2018. https://www.ecdc.europa.eu/sites/portal/files/documents/Monthly%20Measles%20and%20Rubella%20monitoring%20report%20%20February%202018.pdf [accessed February 8, 2019].
[20] European Commission. Proposal for a Council Recommendation on Strengthened Cooperation against Vaccine Preventable Diseases. COM/2018/244 final - 2018/0115 (NLE). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0244&from=EN [accessed February 8, 2019].
[21] WHO, UNHCR, UNICEF. Joint Statement on general principles on vaccination of refugees, asylum-seekers and migrants in the WHO European Region November 2015 2015;2020:1–5. https://reliefweb.int/sites/reliefweb.int/files/resources/EuropeVaccinationPosition_WHO-UNHCR-UNICEFNov.pdf [accessed February 8, 2019].
[22] World Health Organization (WHO) Regional Office for Europe. Circulating vaccine-derived poliovirus type 1 confirmed in Ukraine 2015. http://www.euro.who.int/en/health-topics/communicable-diseases/poliomyelitis/news/news/2015/09/circulating-vaccine-derived-poliovirus-type-1-confirmed-in-ukraine [accessed February 8, 2019].
[23] European Centre for Disease Prevention and Control (ECDC). Infectious diseases of specific relevance to newly-arrived migrants in the EU/EEA. ECDC: Stockholm; 2015. https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/Infectious-diseases-of-specific-relevance-to-newly-arrived-migrants-in-EU-EEA.pdf [accessed February 8, 2019].
[24] European Centre for Disease Prevention and Control (ECDC). Public health guidance on screening and vaccination for infectious diseases in newly arrived migrants within the EU/EEA. Stockholm: ECDC; 2018. https://www.ecdc.europa.eu/sites/portal/files/documents/Public%20health%20guidance%20on%20screening%20and%20vaccination%20of%20migrants%20in%20the%20EU%20EEA.pdf [accessed February 8, 2019].
[25] Giambi C, Del Manso M, Dalla Zuanna T, Riccardo F, Bella A, Caporali MG, et al. National immunization strategies targeting migrants in six European countries. Vaccine 2019;37(32):4610–7. https://doi.org/10.1016/j.vaccine.2018.01.060.
[26] Bica MA, Clemens R. Vaccination policies of immigrants in the EU/EEA Member States–the measles immunization example. Eur J Publ Health 2017;28:439–44. https://doi.org/10.1093/eurpub/ckx197.
[27] Hargreaves S, Nellums LB, Ravensbergen SJ, Friedland JS, Stienstra Y. Divergent approaches in the vaccination of recently arrived migrants to Europe: a survey of national experts from 32 countries, 2017. Eurosurveillance 2018;23. https://doi.org/10.2807/1560-7917.es.2018.23.41.1700772.
[28] Kanitz EE, Wu LA, Giambi C, Strikas RA, Levy-Bruhl D, Stefanoff P, et al. Variation in adult vaccination policies across Europe: An overview from VENICE network on vaccine recommendations, funding and coverage. Vaccine 2012;30:5222–8. https://doi.org/10.1016/j.vaccine.2012.06.012.
[29] Vespe M, Natale F, Pappalardo L. Data sets on irregular migration and irregular migrants in the European Union. Migration Policy Pract. A Bimonthly J Policymakers World 2017;VII 2:26–33.
[30] Giambi C, Del Manso M, Dente M, Napoli C, Montaño-Remacha C, Riccardo F, et al. Immunization strategies targeting newly arrived migrants in Non-EU Countries of the Mediterranean Basin and Black Sea. Int J Environ Res Publ Health 2017;14:459. https://doi.org/10.3390/ijerph14050459.
[31] Hui C, Dunn J, Morton R, Staub L, Tran A, Hargreaves S, et al. Interventions to improve vaccination uptake and cost effectiveness of vaccination strategies in newly arrived migrants in the EU/EEA: a systematic review. Int J Environ Res Publ Health 2018;15:2065. https://doi.org/10.3390/ijerph15102065.
[32] Vito E de, Parente P, Waure C de, Poscia A, Ricciardi W. A review of evidence on equitable delivery, access and utilization of immunization services for migrants and refugees in the WHO European Region. 2017. http://www.euro.who.int/__data/assets/pdf_file/0005/351644/HEN53.pdf?ua=1 [accessed February 8, 2019].
[33] Riccardo F, Dente MG, Kojouharova M, Fabiani M, Alfonsi V, Kurchatova A, et al. Migrant's access to immunization in Mediterranean Countries. Health Policy (New York) 2012;105:17–24. https://doi.org/10.1016/j.healthpol. 2012.02.004.
[34] European Center for Disease Prevention and Control. Migrant health : Background note to the 'ECDC Report on migration and infectious diseases in the EU.' 2009. http://ecdc.europa.eu/en/publications/Publications/0907_TER_Migrant_health_Background_note.pdf [accessed February 8, 2019].
[35] Rosano A, Dauvrin M, Buttigieg SC, Ronda E, Tafforeau J, Dias S. Migrant's access to preventive health services in five EU countries. BMC Health Serv Res 2017;17. https://doi.org/10.1186/s12913-017-2549-9.
[36] World Health Organization (WHO) Regional Office for Europe. European Vaccine Action Plan 2015-2020. 2014. http://www.euro.who.int/en/health-topics/disease-prevention/vaccines-and-immunization/publications/2014/european-vaccine-action-plan-20152020-2014 [accessed February 8, 2019].
[37] Abubakar I, Aldridge RW, Devakumar D, Orcutt M, Burns R, Barreto ML, et al. The UCL–Lancet Commission on Migration and Health: the health of a world on the move. Lancet 2018:392. https://doi.org/10.1016/S0140-6736(18)32114-7.
[38] World Health Organization (WHO) Regional Office for Europe. Health of refugees and migrants Regional situation analysis, practices, experiences, lessons learned and ways forward WHO European Region 2018. 2018. https://www.who.int/migrants/publications/EURO-report.pdf?ua=1 [accessed February 8, 2019].
[39] European Commission. Council Recommendation of 7 December 2018 on strengthened cooperation against vaccine-preventable diseases 2018; 2018. 14152/1/18 REV 1 - 2018/0115 (NLE). https://ec.europa.eu/health/sites/health/files/vaccination/docs/14152_2018_en.pdf [accessed February 8, 2019].
[40] Hargreaves S, Nellums LB, Ramsay M, Saliba V, Majeed A, Mounier-Jack S, et al. Who is responsible for the vaccination of migrants in Europe? Lancet 2018;391:1752–4. https://doi.org/10.1016/s0140-6736(18)30846-8.
[41] World Health Organization (WHO). Promoting the health of refugees and migrants. Draft global action plan, 2019–2023. WHO Executive Board 144th session EB 144/27. 2018. [accessed February 8, 2019].